MULTIMEDIA **UNIVERSITY**

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

PMT0301 – MATHEMATICS III
(All sections/ Groups)

18 OCTOBER 2019
9.00 A.M – 11.00 A.M
(2 Hours)

Question	Marks
1	/10
2	/10
3	/10
4	/10
Total	/40

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **NINE** printed pages excluding cover page, formulae list and statistical table.

2. Answer **ALL FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the **QUESTION BOOKLET**. All necessary working steps **MUST** be shown.

Question 1 [10 marks]

(a) Find an equation of the plane that is perpendicular to the plane $2x + 6y + z = 12$ and passes through the points $P_1(2, 4, 6)$ and $P_2(4, 2, 5)$. [3 marks]

(b) Find the parametric equations of the line passing through the point $(2,4,6)$ and perpendicular to both $2i + 4j$ and $3i + 5k$. [2 marks]

Continued...

(c) Given the following system of linear equations:
$$x - 2y + z = -4$$
$$-y + 3z = -7$$
$$x + 2y = 2$$

Find the inverse matrix by using its adjoint hence solve the system of linear equations by using inverse method.   [5 marks]

Question 2[10 marks]

(a) Find the first six terms of the arithmetic sequence 13 , 7,...   [2.5 marks]

(b) Express $0.1\overline{34}$ as a fraction.   [2.5 marks]

Continued...

(c) Find the mean and median for the data below that refers to the number of bicycles
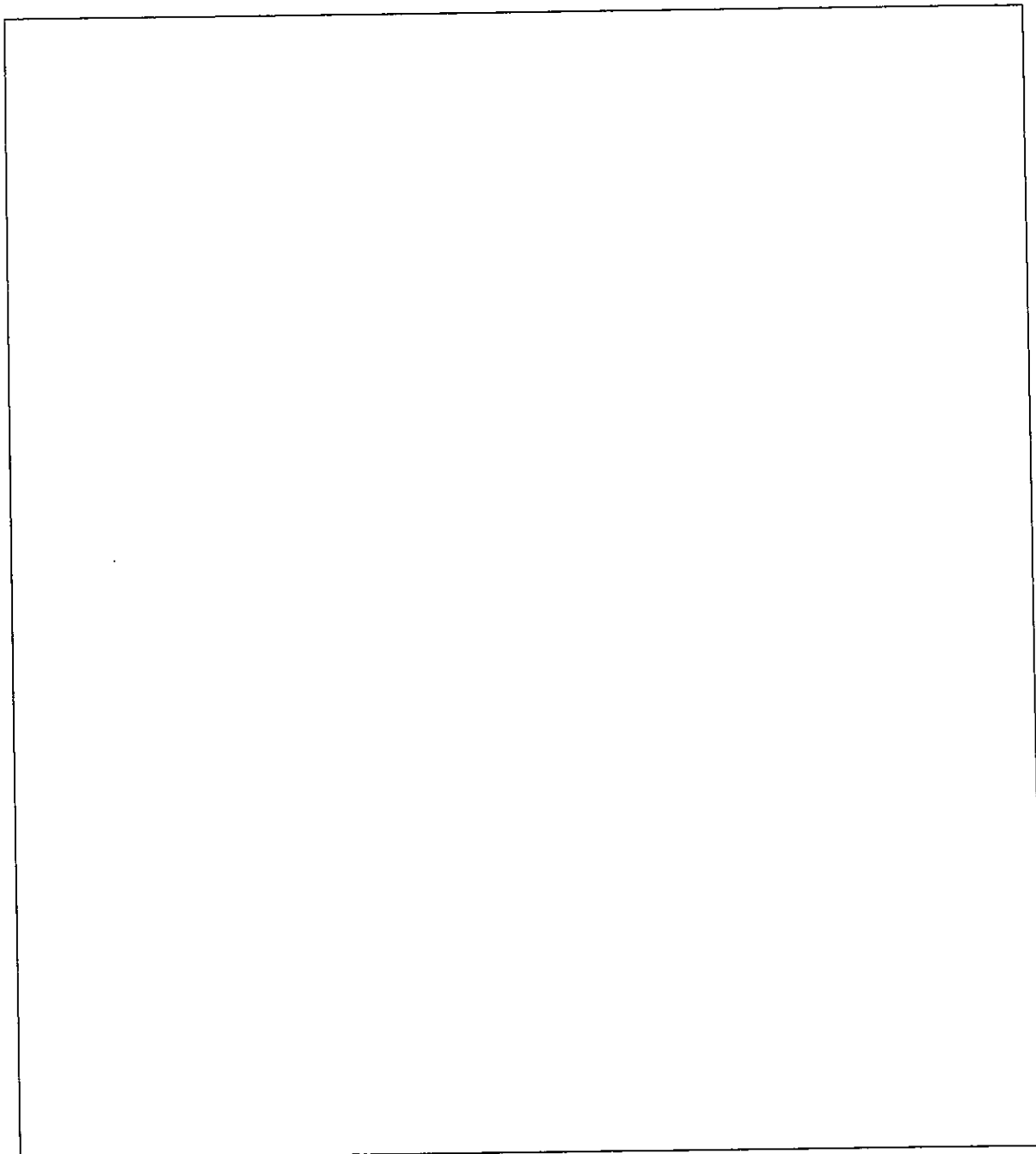owned by 27 families at Taman Bukit Katil.   [3 marks]

Number of bicycles	0	1	2	3	4
Number of families	2	6	13	4	2

Continued...

(d) The data below represents the length (in seconds) of a random sample of songs released in the 90's. Find the mean and sample variance.

$$198 \quad 255 \quad 287 \quad 207 \quad 176 \quad 224 \quad 215 \quad 208 \quad 241$$

[2 marks]

Question 3 [10 marks]

(a) An unbiased coin is tossed twice. The four possible outcomes are equiprobable. If A is the event: both head and tail have occurred and B is the event: at most one tail is observed. Find $P(A), P(B), P(A|B)$ and. $P(B|A)$.   [4 marks]

(b) The card is taken out from a pack of 52 cards. The selection of each cards is equiprobable. Show that the events A and B are independent?

         A: the card drawn is diamond

         B: the card drawn is a knave.   [3 marks]

(c) The probability distribution function of the random variable X is

$$f(x) = \lambda e^{6x-x^2} \quad (\lambda > 0)$$

Determine the mode of this random variable X .   [3 marks]

Question 4[10 marks]

(a) In testing a certain kind of truck tyre over a rugged terrain, it is found that 25% of the trucks fail to complete the test run without blowout of the next 8 trucks tested.
(i) Find the mean and standard deviation   [2 marks]
(ii) Find the probabilities that
(A) two tyres will blowout
(B) more than 2 have blowout   [2 marks]

(b) Assuming that electrical components manufactured by a factory have a life-span before burn out that is normally distributed with a mean of 800 hours and a standard deviation of 40 hours. What is the probability that an electrical component burns out between 778 and 834 hours? [3 marks]
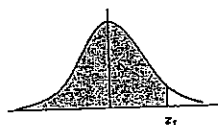
(c) The mean number of bacteria per cm^3 of a liquid is known to be 3. Assuming that the number of bacteria follows a Poisson distribution, find the probability that
(i) there will be no bacteria in 1 cm^3 of liquid [1 marks]
(ii) there will be less than two bacterias in 2 cm^3 of liquid. [2 marks]

End of page

FORMULAE LIST

Vector	**Dot Product:** $$\mathbf{u}\cdot\mathbf{v}=u_1v_1+u_2v_2+u_3v_3 \quad \text{or} \quad \mathbf{u}\cdot\mathbf{v}=\|\mathbf{u}\|\|\mathbf{v}\|\cos\theta$$ **Cross Product:** $$\mathbf{u}\times\mathbf{v}=\begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ u_1 & u_2 & u_3 \\ v_1 & v_2 & v_3 \end{vmatrix}=\begin{vmatrix} u_2 & u_3 \\ v_2 & v_3 \end{vmatrix}\mathbf{i}-\begin{vmatrix} u_1 & u_3 \\ v_1 & v_3 \end{vmatrix}\mathbf{j}+\begin{vmatrix} u_1 & u_2 \\ v_1 & v_2 \end{vmatrix}\mathbf{k}$$ **Line Equation in 3D space:** $$\mathbf{r}=\mathbf{r}_0+t\mathbf{v}$$ **Plane Equation in 3D space:** $$\mathbf{n}.(\mathbf{r}-\mathbf{r}_0)=0$$
Mode	$$L+\left[\dfrac{f_m-f_B}{(f_m-f_A)+(f_m-f_B)}\right]c$$
Median	$$L+\left(\dfrac{\frac{\sum f}{2}-f_L}{f_m}\right)c$$

Mean

	Ungrouped Data		Grouped Data	
	Sample	**Population**	**Sample**	**Population**
	$\bar{x}=\dfrac{\sum x}{n}$	$\mu=\dfrac{\sum x}{N}$	$\bar{x}=\dfrac{\sum mf}{\sum f}$	$\mu=\dfrac{\sum mf}{\sum f}$

Variance

Ungrouped Data	
Sample	**Population**
$s^2=\dfrac{\sum x^2-\dfrac{(\sum x)^2}{n}}{n-1}$	$\sigma^2=\dfrac{\sum x^2-\dfrac{(\sum x)^2}{N}}{N}$

Grouped Data	
Sample	**Population**
$s^2=\dfrac{\sum m^2 f-\dfrac{(\sum mf)^2}{\sum f}}{\sum f-1}$	$s^2=\dfrac{\sum m^2 f-\dfrac{(\sum mf)^2}{\sum f}}{\sum f}$

Conditional Probability	$$P(A|B)=\dfrac{P(A\cap B)}{P(B)}$$
Independent Event	$$P(A|B)=P(A) \text{ or } P(B|A)=P(B) \text{ or } P(A\cap B)=P(A)\cdot P(B)$$
Binomial	$$P(X=x)=\binom{n}{x}p^x q^{n-x} \quad ; \quad \mu=np \quad ; \quad \sigma=\sqrt{npq}$$
Poisson	$$P(X=x)=\dfrac{\lambda^x e^{-\lambda}}{x!} \quad ; \quad \mu=\lambda \quad ; \quad \sigma=\sqrt{\lambda}$$
Standard Normal	$$z=\dfrac{x-\mu}{\sigma}$$

$$p(z \le z_1) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{z_1} e^{-\frac{1}{2}z^2}\, dz$$

The Normal Distribution Function

x	Φ(X)	x	Φ(X)	x	Φ(X)	x	Φ(X)
0.00	0.5000	0.50	0.6915	1.00	0.8413	1.50	0.9332
0.01	0.5040	0.51	0.6950	1.01	0.8438	1.51	0.9345
0.02	0.5080	0.52	0.6985	1.02	0.8461	1.52	0.9357
0.03	0.5120	0.53	0.7019	1.03	0.8485	1.53	0.9370
0.04	0.5160	0.54	0.7054	1.04	0.8508	1.54	0.9382
0.05	0.5199	0.55	0.7088	1.05	0.8531	1.55	0.9394
0.06	0.5239	0.56	0.7123	1.06	0.8554	1.56	0.9406
0.07	0.5279	0.57	0.7157	1.07	0.8577	1.57	0.9418
0.08	0.5319	0.58	0.7190	1.08	0.8599	1.58	0.9429
0.09	0.5359	0.59	0.7224	1.09	0.8621	1.59	0.9441
0.10	0.5398	0.60	0.7257	1.10	0.8643	1.60	0.9452
0.11	0.5438	0.61	0.7291	1.11	0.8665	1.61	0.9463
0.12	0.5478	0.62	0.7324	1.12	0.8686	1.62	0.9474
0.13	0.5517	0.63	0.7357	1.13	0.8708	1.63	0.9484
0.14	0.5557	0.64	0.7389	1.14	0.8729	1.64	0.9495
0.15	0.5596	0.65	0.7422	1.15	0.8749	1.65	0.9505
0.16	0.5636	0.66	0.7454	1.16	0.8770	1.66	0.9515
0.17	0.5675	0.67	0.7486	1.17	0.8790	1.67	0.9525
0.18	0.5714	0.68	0.7517	1.18	0.8810	1.68	0.9535
0.19	0.5753	0.69	0.7549	1.19	0.8830	1.69	0.9545
0.20	0.5793	0.70	0.7580	1.20	0.8849	1.70	0.9554
0.21	0.5832	0.71	0.7611	1.21	0.8869	1.71	0.9564
0.22	0.5871	0.72	0.7642	1.22	0.8888	1.72	0.9573
0.23	0.5910	0.73	0.7673	1.23	0.8907	1.73	0.9582
0.24	0.5948	0.74	0.7704	1.24	0.8925	1.74	0.9591
0.25	0.5987	0.75	0.7734	1.25	0.8944	1.75	0.9599
0.26	0.6026	0.76	0.7764	1.26	0.8962	1.76	0.9608
0.27	0.6064	0.77	0.7794	1.27	0.8980	1.77	0.9616
0.28	0.6103	0.78	0.7823	1.28	0.8997	1.78	0.9625
0.29	0.6141	0.79	0.7852	1.29	0.9015	1.79	0.9633
0.30	0.6179	0.80	0.7881	1.30	0.9032	1.80	0.9641
0.31	0.6217	0.81	0.7910	1.31	0.9049	1.81	0.9649
0.32	0.6255	0.82	0.7939	1.32	0.9066	1.82	0.9656
0.33	0.6293	0.83	0.7967	1.33	0.9082	1.83	0.9664
0.34	0.6331	0.84	0.7995	1.34	0.9099	1.84	0.9671
0.35	0.6368	0.85	0.8023	1.35	0.9115	1.85	0.9678
0.36	0.6406	0.86	0.8051	1.36	0.9131	1.86	0.9686
0.37	0.6443	0.87	0.8078	1.37	0.9147	1.87	0.9693
0.38	0.6480	0.88	0.8106	1.38	0.9162	1.88	0.9699
0.39	0.6517	0.89	0.8133	1.39	0.9177	1.89	0.9706
0.40	0.6554	0.90	0.8159	1.40	0.9192	1.90	0.9713
0.41	0.6591	0.91	0.8186	1.41	0.9207	1.91	0.9719
0.42	0.6628	0.92	0.8212	1.42	0.9222	1.92	0.9726
0.43	0.6664	0.93	0.8238	1.43	0.9236	1.93	0.9732
0.44	0.6700	0.94	0.8264	1.44	0.9251	1.94	0.9738
0.45	0.6736	0.95	0.8289	1.45	0.9265	1.95	0.9744
0.46	0.6772	0.96	0.8315	1.46	0.9279	1.96	0.9750
0.47	0.6808	0.97	0.8340	1.47	0.9292	1.97	0.9756
0.48	0.6844	0.98	0.8365	1.48	0.9306	1.98	0.9761
0.49	0.6879	0.99	0.8389	1.49	0.9319	1.99	0.9767
0.50	0.6915	1.00	0.8413	1.50	0.9332	2.00	0.9772

x	Φ(X)	x	Φ(x)	x	Φ(X)	x	Φ(X)
2.00	0.97725	2.50	0.99379	3.00	0.99865	3.50	0.99977
2.01	0.97778	2.51	0.99396	3.01	0.99869	3.51	0.99978
2.02	0.97831	2.52	0.99413	3.02	0.99874	3.52	0.99978
2.03	0.97882	2.53	0.99430	3.03	0.99878	3.53	0.99979
2.04	0.97932	2.54	0.99446	3.04	0.99882	3.54	0.99980
2.05	0.97982	2.55	0.99461	3.05	0.99886	3.55	0.99981
2.06	0.98030	2.56	0.99477	3.06	0.99889	3.56	0.99981
2.07	0.98077	2.57	0.99492	3.07	0.99893	3.57	0.99982
2.08	0.98124	2.58	0.99506	3.08	0.99896	3.58	0.99983
2.09	0.98169	2.59	0.99520	3.09	0.99900	3.59	0.99983
2.10	0.98214	2.60	0.99534	3.10	0.99903	3.60	0.99984
2.11	0.98257	2.61	0.99547	3.11	0.99906	3.61	0.99985
2.12	0.98300	2.62	0.99560	3.12	0.99910	3.62	0.99985
2.13	0.98341	2.63	0.99573	3.13	0.99913	3.63	0.99986
2.14	0.98382	2.64	0.99585	3.14	0.99916	3.64	0.99986
2.15	0.98422	2.65	0.99598	3.15	0.99918	3.65	0.99987
2.16	0.98461	2.66	0.99609	3.16	0.99921	3.66	0.99987
2.17	0.98500	2.67	0.99621	3.17	0.99924	3.67	0.99988
2.18	0.98537	2.68	0.99632	3.18	0.99926	3.68	0.99988
2.19	0.98574	2.69	0.99643	3.19	0.99929	3.69	0.99989
2.20	0.98610	2.70	0.99653	3.20	0.99931	3.70	0.99989
2.21	0.98645	2.71	0.99664	3.21	0.99934	3.71	0.99990
2.22	0.98679	2.72	0.99674	3.22	0.99936	3.72	0.99990
2.23	0.98713	2.73	0.99683	3.23	0.99938	3.73	0.99990
2.24	0.98745	2.74	0.99693	3.24	0.99940	3.74	0.99991
2.25	0.98778	2.75	0.99702	3.25	0.99942	3.75	0.99991
2.26	0.98809	2.76	0.99711	3.26	0.99944	3.76	0.99992
2.27	0.98840	2.77	0.99720	3.27	0.99946	3.77	0.99992
2.28	0.98870	2.78	0.99728	3.28	0.99948	3.78	0.99992
2.29	0.98899	2.79	0.99736	3.29	0.99950	3.79	0.99992
2.30	0.98928	2.80	0.99744	3.30	0.99952	3.80	0.99993
2.31	0.98956	2.81	0.99752	3.31	0.99953	3.81	0.99993
2.32	0.98983	2.82	0.99760	3.32	0.99955	3.82	0.99993
2.33	0.99010	2.83	0.99767	3.33	0.99957	3.83	0.99994
2.34	0.99036	2.84	0.99774	3.34	0.99958	3.84	0.99994
2.35	0.99061	2.85	0.99781	3.35	0.99960	3.85	0.99994
2.36	0.99086	2.86	0.99788	3.36	0.99961	3.86	0.99994
2.37	0.99111	2.87	0.99795	3.37	0.99962	3.87	0.99995
2.38	0.99134	2.88	0.99801	3.38	0.99964	3.88	0.99995
2.39	0.99158	2.89	0.99807	3.39	0.99965	3.89	0.99995
2.40	0.99180	2.90	0.99813	3.40	0.99966	3.90	0.99995
2.41	0.99202	2.91	0.99819	3.41	0.99968	3.91	0.99995
2.42	0.99224	2.92	0.99825	3.42	0.99969	3.92	0.99996
2.43	0.99245	2.93	0.99831	3.43	0.99970	3.93	0.99996
2.44	0.99266	2.94	0.99836	3.44	0.99971	3.94	0.99996
2.45	0.99286	2.95	0.99841	3.45	0.99972	3.95	0.99996
2.46	0.99305	2.96	0.99846	3.46	0.99973	3.96	0.99996
2.47	0.99324	2.97	0.99851	3.47	0.99974	3.97	0.99996
2.48	0.99343	2.98	0.99856	3.48	0.99975	3.98	0.99997
2.49	0.99361	2.99	0.99861	3.49	0.99976	3.99	0.99997
2.50	0.99379	3.00	0.99865	3.50	0.99977	4.00	0.99997